Issuances and Repurchases: An explanation based on CEO risk-taking incentives

A Thesis submitted to the College of

Graduate Studies and Research

in partial fulfillment of the requirements

for the Degree of Master of Science in Finance

in the Department of Finance and Management Science

Edwards School of Business University of Saskatchewan

Saskatoon, Saskatchewan, Canada

by

Harun Rashid

Permission to Use

In presenting this thesis in partial fulfillment of the requirements for a Postgraduate degree from the University of Saskatchewan, I agree that the Libraries of this University may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the professor or professors who supervised my thesis work or, in their absence, by the Head of the Department or the Dean of the College in which my thesis work was done. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of Saskatchewan in any scholarly use which may be made of any material in my thesis.

Requests for permission to copy or to make other use of material in this thesis in whole or part should be addressed to:

Head of the Department of Finance and Management Science

Edwards School of Business

University of Saskatchewan

25 Campus Drive

Saskatoon, Saskatchewan S7N 5A7

Abstract

There is an ongoing debate on whether risk-taking incentives align risk-averse managers' interests with those of shareholders or whether such incentives lead to excessively risky firm and leverage policies. In this study, we shed light on this debate by using CEO risk-taking incentives, measured by the sensitivity of CEO wealth to changes in stock return volatility (*Vega*), and explain how *Vega* affects firms' security issuance and repurchase activities. In general, we find that a higher *Vega* increases (decreases) the likelihood of debt issuance (share issuance) and it decreases (increases) the propensity of debt retirement (share repurchase). However, in high-levered firms, the positive effect of *Vega* on debt issuance and the negative influence of *Vega* on debt retirement are diminished. One the other hand, for equity issuance and repurchases, high leverage does not seem to alter the impact of *Vega*. These findings have three main implications: 1) in general, CEO risk-taking incentives (*Vega*) do affect the financing decisions of firms by increasing firms' degree of leverage, (2) when existing leverage is high, CEO risk-taking incentives do not seem to induce CEOs to take excessive financial risks through debt issuance, but such incentives encourage them to continue repurchasing shares that would lead to even higher debt ratios and non-operational risks, and (3) firms with high *Vega* do not seem to adopt target debt ratios.

JEL Classification: G30, G32, J33

Key Words: Compensation incentives, risk taking incentives, external financing, capital structure

Acknowledgements

All praises belong to Allah (the God), the Lord of the universe, for all the blessings in my life. I would like to thank my supervisors Dr. Min Maung and Dr. Craig Wilson for their excellent guidance and support. Without their untiring feedback and support this thesis would have been difficult to finish. I would also like to thank our program Director, Dr. Marie Racine, for being a wonderful guardian, and for her genuine concerns and sincere care for our (students of M.Sc. in Finance) academic success and personal comforts. I am thankful to Dr. Miaomiao Yu, my committee member, for her useful feedback. I sincerely appreciate and acknowledge SAS help from Dr. Yixin Liu, University of New Hampshire. I am also thankful to Dr. Abdullah Mamun for his valuable advices from the beginning of this program. Special thanks to Ms. Brenda Orischuk, Ms. Wanda Gonda, and the IT support staff for their relentless support behind the scenes.

I am forever indebted to my mother for her prayer, love, and moral support. My father would have been proud and happy to see me graduate from University of Saskatchewan. I miss you! I am also grateful to my wife for taking care of the family and making my student life at University of Saskatchewan smooth.

Table of Contents

List of Tables

1 Introduction

There is an ongoing debate on whether risk-taking incentives align risk-averse managers' interests with those of shareholders or whether such incentives lead to excessive risk taking (Eisdorfer, Giaccotto and White, 2013; Lin, Chou, and Wang, 2012; Dong, Wang and Xie, 2010; Francis, Hasan and Sharma, 2011). We further explore this debate using CEO risk-taking incentives embedded in compensation incentives. The sensitivity of managers' wealth to changes in stock return volatility is measured by *Vega*, which we define as the sensitivity of CEO wealth to a 1% change in stock return volatility. Compensation incentives supposedly align managers' interests with those of shareholders (Jensen and Meckling, 1976). To this end, *Vega* encourages overly risk-averse managers to take on more risks, thereby aligning their interests with those of shareholders. Various studies show that *Vega* is positively related to risky firm characteristics such as stock return volatility (Cohen, Hall and Viceira, 2000 and Guay, 1999) and leverage (Cohen et al., 2000; Coles, Daniel, and Naveen, 2006; Chava and Purnanandam, 2010). However, an overly high *Vega* could have unintended consequences: equity-type compensation induces managers to over-invest (Eisdorfer et al., 2012) or adopt an excessively risky leverage policy (Dong et al., 2010). Dong, Wang, and Xie (2010) show that CEOs with high *Vega* are likely to choose debt over equity in order to raise capital even when firm leverage is beyond its target ratio.[1] On the other hand, Albring et al. (2011) and Meneghetti (2012) argue that compensation incentives induce managers to be monitored by lenders. Hence, it could be argued that such monitoring helps prevent firms from taking on excessive risk. Moreover, Jensen (1986) argues that leverage disciplines managers. Accordingly, if an over-levered firm attempts to issue debt, it faces strong resistance from lenders. In general, the effect of *Vega* on corporate risk-taking (or excessive risk-

[1]However, the concept of a target leverage ratio itself is a problematic issue, as there lacks consensus on what target leverage should be (Shyam-Sunder and Myers, 1999; Jong, Verbeek, and Verwijmeren, 2011).

taking) is thus far unclear.

We explore a hitherto overlooked facet of the impact of *Vega* on corporate risk-taking by investigating the channels of external financing through which *Vega* affects firm leverage. Specifically, we explore how *Vega* affects debt issuance, share issuance, debt retirement, and share repurchase. While it is known that *Vega* induces firms to adopt a higher leverage policy, how this takes place is unclear. Firms could issue more debt or repurchase stock to increase leverage. Evidence from existing research suggests CEO compensation incentives have direct impact on debt issuance. However, whether high *Vega* results in excessive debt is an open question. For instance, Shaw (2011) documents that higher pay-performance sensitivity leads to a lower cost of new debt, implying that new lenders view compensation incentives favorably. Thus, we expect a positive (negative) association between *Vega* and debt issuance (share issuance). However, when leverage is already high, CEOs with a higher *Vega* could be deterred from issuing debt by existing lenders, or the CEOs themselves may avoid increasing leverage further to avoid costs of financial distress. Conversely, we expect a negative (positive) relation between *Vega* and debt retirement (share repurchase), because share repurchasing increases leverage and debt retiring reduces leverage. However, this relation should also be conditional upon the level of existing leverage.

Using a sample of 15,623 firm year observations between 1992 and 2006, we empirically investigate the relation between *Vega* and external financing decisions. We present strong evidence that *Vega* impacts debt issuance (share issuance) positively (negatively), and debt retirement (share repurchase) negatively (positively). However, in high-levered firms, while leverage mitigates the impact of *Vega* on debt issuance and debt retirement, it does not alter the influence of *Vega* on equity issuance and repurchases. Therefore, contrary to Dong et al. (2010), we find that *Vega* does not induce managers to issue debt if firm leverage is already high.[2] In general, our evidence suggests that a higher *Vega* causes firms to increase leverage through debt issuance and share repurchase. Our evidence also indicates that, in high-levered firms, a higher *Vega* induces CEOs to take on more risks through repurchasing shares.

We make at least three contributions to the literature of finance. First, we complement the study of Coles et al. (2006) by identifying the main channels through which CEOs increase firm leverage. To the best of our knowledge our study is the first work that examines such channels. Second, our study is the only work that investigates the relationship between sensitivity of CEO wealth to the changes in stock return volatility and security repurchases (debt retirement and share repurchase). Third, our study is also the first study to show that CEOs' risk-taking behavior induced by risk-taking incentives is conditional upon a firm's debt ratio. *Vega*'s influence on debt issuance and debt retirement in a low-levered firm is different from its influence on a high-levered firm.[3] For example, we find that CEOs with a higher *Vega* in high levered firms tend to avoid issuing debt but are likely to continue repurchasing shares and increase financial risks further. Dong et al. (2010) argue that risk taking-incentives encourage CEOs to take on excessive risks through debt issuance in order to increase their wealth from stock options holding. We show that risk-taking incentives fail to motivate CEOs to issue debt in high-levered firms.

The remainder of the paper is as follows: The literature review and hypothesis development is presented in section 2. In section 3, data and methodology are presented. Results and analysis are included in Section 4. Section 5 offers robustness tests and Section 6 concludes.

---

[2]Methodologically our study is different from the study of Dong et al. (2010). For instance, they use a subsample of over-levered firms and we use a dummy variable to define high-levered firms and interact it with *Vega*; they ignore security repurchase in defining security issuance, and we use net proceeds of security issuance; they use firm characteristics to measure target debt ratio, we use industry adjusted leverage, which is a proxy of target debt ratio.
[3]If a firm's yearly industry adjusted leverage is above 75 percentile of the same industry for the same year then it is defined as a high-levered firm.

2 Related Literature Review and Hypothesis Development

2.1 Literature Review

Managers and shareholders both are risk-averse. However, managers, unlike shareholders, cannot diversify firm specific risks. Therefore, they tend to avoid taking risky but positive NPV projects. This tendency of avoiding risk creates conflicts of interest between managers and shareholders. An effective way of minimizing this conflict is to give managers some ownership as part of their compensation. Equity-based compensation incentives are designed to align managerial interests with those of shareholders (Jensen and Meckling, 1976). The classic empirical work of Jensen and Murphy (1990) provides some evidence in favor of this theory. They find that (p. 225) "…the pay-performance relation (including pay, options, stockholdings, and dismissal) for chief executive officers indicate that CEO wealth changes $3.25 for every $1,000 change in shareholder wealth." Compensation incentives are also intended to encourage managers to perform better by adopting risky firm policies if these policies enhance firm value. Two important characteristics of compensation incentives are the sensitivity of CEO wealth to changes in stock price (*Delta*) or the pay-performance sensitivity, and the sensitivity of CEO wealth to changes in stock return volatility (*Vega*). Current literature uses the one year approximation proxy method developed by Core and Guay (2002) to measure these two sensitivities from compensation incentives.[4]

Whether pay-performance sensitivity (*Delta*) makes managers seek or avoid risk is an unsettled issue in the literature (Coles et al., 2006; Armstrong and Vashishtha, 2012). John and John (1993) find *Delta* is negatively associated with leverage. Similarly, Brockman, Martin and

[4]Contrary to the widely used measures of compensation incentives, Lewellen (2006) measures managerial financing incentives as the change in certainty equivalent wealth of CEO due to changes in leverage. Lewellen (2006) argues that compensation incentives make managers risk averse and reports that higher financing incentives increase the likelihood of preferring equity over debt.

Unlu (2010) find *Delta* is negatively associated with short-term maturity debt. Knopf, Nam, and Thornton (2002) argue that *Delta* make managers risk averse. Ross (2004) argues that high level of *Delta* incentivizes managers to avoid risk. Coles et al. (2006, p. 431) explain "...higher *Delta* can mean that managers will work harder or more effectively because managers share gains and losses with shareholders. Of course, another effect of increased *Delta* is to expose managers to more risk ... Accordingly, it is possible that managers will forgo some positive net present value (NPV) projects if those projects are very risky."

Prior studies suggest that *Vega* encourages managers to take on more risks (Guay, 1999; Knopf et al., 2002; Coles et al., 2006). It is well documented that a higher *Vega* is positively related to risky firm policies. Specifically, Cohen et al. (2000), and Guay (1999) investigate the relation between *Vega* and firm risks using stock return volatility. Both studies find there is a positive relation between *Vega* and firm risks. Low (2009) links *Vega* and risk taking behavior to antitakeover provisions. She finds that low *Vega* firms reduce risks when they have an increased level of antitakeover provisions. Gormley, Matsa and Milbourn (2012) find that a higher *Vega* has positive effect on leverage and R&D, and has negative effect on cash reserves and diversifying acquisitions. Particularly relevant to our study is the relation between *Vega* and leverage. Higher *Vega* firms maintain higher leverage (Cohen et al., 2000; Coles et al., 2006; Chava and Purnanandam, 2010), which in turn makes equity riskier. Albring et al. (2011) report that measures of CEO compensation incentive sensitivities- *Delta* and *Vega*- are positively associated with issuance of syndicated debt.[5]

Do compensation incentives lead to excessive risk-taking? Dong et al. (2010) examine the

[5]Albring, Khurana, Nejadmalayeri and Pereira (2011) argue due to information asymmetry borrowing funds from financial firms signal firm profitability which increases market value. As a result, managers' wealth increases. Hence, managers are willing to be monitored by financial intermediaries when their compensation is tied with firm performance.

effect of compensation incentives on the likelihood of share and debt issuances. They argue that managers take excessive risk in financing decisions to increase their wealth. Using a sub-sample of over-levered firms they show that CEOs with higher *Vega* are more likely to issue debt instead of equity even when firms are over-levered. Hence, they argue *Vega* induces managers to adopt excessively risky leverage policies that go beyond the target leverage. However, there is a selection bias in creating a sub-sample of over-levered firms. Their argument also raises questions regarding target leverage and excessive risk taking. According to Shyam-Sunder and Myers (1999) and Jong, Verbeek, and Verwijmeren (2011), non-financial firms do not have any target debt ratio. Jong et al. (2011, p. 1304) state "for issue decisions, we find that only a small minority of the firms that have above-target leverage in a given year issue equity instead of debt. Hence, most firms increase their leverage, even when they are already above their estimated target….the static trade-off theory is not a strong predictor of firm issuing decisions." Besides, Francis et al. (2011) contend that compensation incentives prevent managers from over-investing because such incentives align managers' wealth with firm value. Jensen (1986), Albring et al. (2011) and Meneghetti (2012) also suggest that lenders monitor managers. Hence, naturally, lenders will prevent managers from taking on excessive debt. Therefore, Dong et al.'s (2010) claim that a higher *Vega* causes CEOs to take excessive risk needs further investigation. Moreover, the authors ignore security repurchases in defining security issuances. In many cases firms issue and repurchase securities simultaneously, and if the proceeds from repurchase exceed the proceeds from issuance, then only considering issuance is likely to give misleading evidence.

Before exploring other channels of financing further, it is useful to briefly review traditional capital structure theories. The static trade-off theory and the pecking order theory offer two different explanations about the capital structure of a firm. The static trade-off theory asserts that firms have a target debt ratio where the marginal benefit of borrowing balances the marginal cost of borrowing. As long as a firm is under that target ratio, it will issue debt and increase leverage in order to reap the benefits of borrowing such as tax shield advantage. On the other hand, the pecking order theory predicts that due to the high cost of information asymmetry, firms issue stocks to undertake risky projects only when other sources of financing such as retained earnings and debt (both low risk and high risk debts) are exhausted (Myers, 1984, and Myers and Majluf, 1984). Shyam-Sunder and Myers (1999) contend that changes in leverage take place for the need of external financing and not to reach a target debt ratio. Shyam-Sunder and Myers (1999) find evidence that non-financial firms do not have any target debt ratios. They argue that the static trade off theory does not have the power to explain capital structure, but the pecking order theory does. However, Fama and French (2005) oppose the validity of the pecking order theory and show that stock issuance is not limited to financially constrained firms only. Gatchev, Spindt and Tarhan (2009) also do not find evidence in favour of pecking order theory. Jong, Verbeek, and Verwijmeren (2011) examine the conforming and conflicting areas between the pecking order theory and the static trade-off theory in order to evaluate one's superiority over the other in explaining financing decisions. They show that most firms issue debt until they reach their debt capacity, and do not follow any target debt ratio, which is consistent with the pecking order theory. However, they find that the static trade-off theory is a better model in explaining repurchasing decisions. They report that under-levered firms repurchase shares to reach their target debt ratio. Hence, these two capital structure theories suggest that a firm choses such a debt ratio that increases shareholders wealth. Similarly, we expect *Vega* to motivate CEOs to maintain, through external financing activities, such a capital structure that increases firm risk and at the same time improves firm value.

Share repurchase has become a common cash payout policy to shareholders (Skinner 2008). Signalling and free cash flows are the two main theories of share repurchases. However, prior evidence suggests that managerial compensation incentives such as options have significant impact on share repurchases. There are two hypotheses that link share repurchases with executive compensation incentives: the option funding hypothesis and the substitution hypothesis (Kahle, 2002). Chance and Yang (2011) argue that, in the absence of desirable investment projects, executives benefit from options holding by repurchasing shares. Bhargava (2011) examines how the value of stock options of executives affects share repurchase and finds that share repurchase is insignificantly related to the values of executive stock options granted but that the values of options realized in the previous year are positively associated with share repurchase. Fried (2011) attributes biased external financing decisions that favor managers' wealth over firm wealth or societal wealth to equity based compensation incentives. He argues that equity based compensation encourages managers to issue shares when the market share price is above their worth and repurchase them when the price is below the actual value. In both cases managers' wealth improves but not aggregate shareholder wealth (both old and new shareholders). Also, he argues, that this kind of financing decision does not improve the overall value of a firm.

2.2 Hypotheses

Existing literature suggests that *Vega* is positively associated with risky firm policies and that debt issuance increases firm risk.

Hypothesis 1a: *There is a positive association between Vega and debt issues, ceteris paribus.*

Although we expect that *Vega* positively affects issuance of debt, our expectation differs for high-levered firms. Lenders are aware of CEO risk-taking incentives. Therefore, if leverage is already high, lenders would prevent CEOs from increasing it further. In addition, when leverage is already high, CEOs themselves are likely to avoid issuing debt due to the costs of financial distress. Thus, high leverage reduces CEO risk-taking incentives.

Hypothesis 1b: *The positive effect of Vega on debt issues diminishes in high-levered firms, ceteris paribus.*

Issuing shares to undertake investment opportunities reduces both firm leverage and equity risk. Since, CEO wealth increases with increased risk-taking activities, we expect to see a negative association between *Vega* and equity issues.

Hypothesis 2a: *There is a negative association between Vega and share issues, ceteris paribus.*

However, if the debt capacity is saturated, firms would have little choice but to issue equity to finance new projects.

Hypothesis 2b: *The negative effect of Vega on share issues diminishes in high-levered firms, ceteris paribus.*

Security issuance is not the only means to affect leverage. Security repurchases (both debt and share) affect leverage as well. While repurchasing shares increases leverage or firm risk, retiring debt decreases it.

Hypothesis 3a: *There is a negative association between Vega and debt retirement, ceteris paribus.*

Although we expect that *Vega* typically influences debt retirement negatively, high leverage may prevent lenders from extending new credit, which would lead to net debt retirement regardless of CEO risk taking incentives. Thus, we expect high leverage to reduce the negative impact of *Vega* on debt retirement.

Hypothesis 3b: *The negative association between Vega and debt retirement diminishes in high-levered firms, ceteris paribus.*

Repurchasing shares increases leverage and evidence indicates that *Vega* implies higher debt ratio. Bernanke (1989) argues that share repurchase increases debt ratio and improves a firm's efficiency and operations.

Hypothesis 4a: *There is a positive association between Vega and share repurchase, ceteris paribus.*

However, if a firm already has high leverage then lenders may restrict share repurchasing.

Hypothesis 4b: *The effect of Vega on likelihood of share repurchase diminishes in high-levered firms, ceteris paribus.*

3 Data and Methodology

3.1 Data and Sample

We use three different databases to collect our data. We collect balance sheet, cash flow, and income statement related items from Compustat. Stock return data are collected from CRSP. CEO compensation related data are collected from Execucomp. Interest rates of 10-year-constant maturity treasury bonds are collected from the Federal Reserve Bank of St. Louis. Our sample covers the period from 1992 to 2006. Execucomp reports data starting from 1992. Consistent with previous studies we eliminate financial firms (SIC 6000-6999) and utility firms (SIC 4900-4999). After merging data from all sources we eliminate firms if their assets or sales are missing. We replace missing values of R&D expenditures with zeros. Finally we have a total of 15,623 firm-year observations. We winsorize all variables at the 1^{st} and 99^{th} percentiles.

3.2 Variables

3.2.1 Dependent Variables

Share issue is defined as the proceeds from sale of common and preferred stock (*SSTK*) minus the purchase of common and preferred stocks *(PRSTKC*) scaled by book value of total assets.

Debt issue is measured as the proceeds from long-term debt issuance (*DLTIS*) minus the reduction in long-term debt (*DLTR*) scaled by book value of total assets.

3.2.2 Independent Variables

Main variable

Vega, which measures risk-taking incentives, is measured as the change in value (in dollars) of CEO wealth (value of options) for a 1% change in annualized stock return volatility. We use daily stock return standard deviation multiplied by $\sqrt{252}$ to annualize the stock return volatility. Details to construct *Vega* are provided in the appendix section.

Important control variables

Delta, which measures performance incentives, is defined as the change in value (in dollars) of CEO wealth (value of options, restricted stock grants, and stocks) for a 1% change in stock price. Details to construct *Delta* are provided in the appendix.

Sales is measured as log(1 + total sales). Total sales is measured in millions. *Sales* is a proxy for firm size.

Assets is log (1 + book value of total assets). Book value of total assets is donated in millions. We use *Assets* as a proxy of firm size for robustness.

Cashflow is defined as EBITDA scaled by book value of total assets. Intuitively, cash flow has a direct impact on debt and share issuance. *Cashflow* is also a proxy for firm profitability. Empirical evidence suggests that firms with a higher level of *Cashflow* issue less equity (Dong et al., 2010; McLean, 2011), although evidence is mixed for debt.

Leverage is the ratio of total long term debt to book value of total assets. We control for long-term debt rather than total debt because debt and share issuance are mostly affected by the degree of long-term debt. The current liability portion of total debt varies mainly with net working capital requirements.

Industry_adjusted_leverage is defined as the *leverage* minus yearly industry mean leverage based on 2-digit SIC code. Industry mean or median leverage is widely used as a proxy for target debt ratio (see Gilson, 1997; Hovakimian, Opler, and Titman, 2001; Faccio and Masulis, 2005).

High_leverage is a dummy variable that takes on the value of one when the industry adjusted long-term debt ratio is in the top quartile (i.e. above 75 percent of sample leverage) for a given year. Highly levered firms are less likely to issue debt because of financial distress and lender credit rationing.

MB is the ratio of firm market value of total assets to its book value of total assets. Market value of total assets is measured as the number of common shares outstanding multiplied by the fiscal year-end stock price plus the redeemable value of preferred stock plus total long and short term debt. *MB* is a proxy for firm growth. Higher *MB* firms require more external financing to meet growth requirements. Some studies use *MB* as a proxy for market overvaluation of assets.

Capex is the amount of capital expenditures scaled by total book value of assets. Higher *Capex* indicates a greater need for external financing.

Additional Control variables

Cash is defined as cash and cash equivalent assets scaled by book value of total assets. Firms with higher cash reserves need less external financing. Holding cash for precautionary motives (McLean, 2012) or meeting short term liquidity needs may lead to share issuance (DeAngelo, DeAngelo and Stulz, 2010).

Dividend equals cash dividends scaled by book value of total assets.

GPPE is calculated as value of gross property, plant, and equipment scaled by book value of total assets. *GPPE* can be used as a proxy for total tangible assets.

RD is defined as research and development expenditures scaled by book value of total assets. The literature suggests that *RD* can be used as a proxy for precautionary motives (McLean, 2011) and for information asymmetry (Tong, 2010).

Rating is a dummy variable indicating if the overall long term credit rating of a firm is available. Not all firms in our sample have credit ratings, so when we use actual credit rating instead of a dummy we lose about half of the observations from our sample. Meneghetti (2012) uses a dummy variable for investment grade credit rating.

CEO Wealth is CEO total compensation comprising the value of salary, bonus, restricted stocks granted, stock options granted, long-terms incentives, other annual, and all other total. CEO wealth may make managers risk averse because all his portfolios are in one basket. On the other hand, CEOs may want to work hard to improve the firm value and thereby increase his total wealth. Therefore, no matter what role CEO Wealth plays in risk-taking it is important to control for it especially during carrying out the external financing activities.

3.2 Methodology

Depending on the motivation, different studies use different sets of control variables for debt and share issuances. The most commonly used variables are firm fundamentals, such as size (either assets or sales), leverage, profitability or cash flow, market to book ratio, capital expenditures or asset tangibility (either gross or net property plant and equipment), and industry mean (median) leverage. These explanatory variables for security issuance are similar to those that affect capital structure. The variables used by Rajan and Zingales (1995) (market to book ratio, profitability, asset tangibility, and sales) are also widely used in the literature to determine leverage. Using a sample of 270,000 firm year observations for the period between 1950 and 2003, Frank and Goyal (2009) investigate the important factors that influence capital structure and find that the most important factors of market leverage are median industry leverage, the ratio of market to book value of assets (*MB*), asset tangibility, firm profitability, firm size (log of assets), and expected inflation.

Therefore, we use the following model:

$$\begin{aligned} Y_{it} &= \alpha_i + \alpha_t + \beta_1 Vega_{it} + \beta_2 Delta_{it} + \beta_3 Industry\_adjusted\_\mathrm{Leverage}_{\mathrm{it\text{-}1}} \\ &+ \beta_4 Sales_{\mathrm{it\text{-}1}} + \beta_5 MB_{\mathrm{it\text{-}1}} + \beta_6 Cashflow_{\mathrm{it\text{-}1}} + \beta_7 Capex_{\mathrm{it}} + \varepsilon_{it}, \end{aligned} \tag{1}$$

where Y_{it} represents a dependent variable such as *Debt Issue*, *Share Issue*, *Debt Repurchase* and *Share Repurchase* for firm *i* for year *t.*[6] We use current year *Vega* and *Delta* because compensation incentives of the current year are likely to influence the risk taking behavior and performance of managers in the current year. Thus, for capital structure decisions, the contemporaneous *Vega* and *Delta* of managers are important. Similarly we use contemporaneous *Capex* (capital expenditures) because capital expenditures of the current year better represent the need for external financing. For *sales* (firm size), *leverage*, *cashflow* (profitability), and *MB* (firm growth), we use prior year observations. Whether a firm issues debt or equity depends on the prior year firm fundamentals. For example, if a firm was highly profitable in the previous year then it is less likely to need external financing. Similarly, if leverage in the prior year was high, then a firm has less capacity to issue debt.

In equation (1) we expect β_1 to be positive *for debt issue* and *share repurchase* and negative for *share issue* and *debt retirement*. In the model we also include other control variables such as *GPPE*, R&D, credit rating dummy, and others. For highly levered firms we modify Model 1 and introduce an interaction term between *Vega* and prior leverage. We expect the coefficient of this interaction term to be negative for *debt issue* and *share repurchase* and positive for

---

[6]For logistic regressions, the dependent takes on the value of one for firms that issue/repurchase equity/debt, zero otherwise.

share issue and *debt retirement*.

$$Y_{it} = \alpha_i + \alpha_t + \beta_1 Vega_{it} + \beta_2 Delta_{it} + \beta_3 High\_leverage_{\text{it-1}} + \beta_4 Vega_{\text{it}} * High\_leverage_{\text{it-1}} + \beta_5 Sales_{\text{t-1}} + \beta_6 MB_{\text{t-1}} + \beta_7 Cashflow_{\text{t-1}} + \beta_8 Capex_{\text{t-1}} + \beta_9 Industry\_mean\_leverage_{\text{t-1}} + \varepsilon_{\text{it}}. \quad (2)$$

For logistic regressions, the dependent variables are constructed subject to specific thresholds of debt issuance or share issuance of 1% or 0.5% of total assets.[7] We also control for year and firm fixed effects. For robustness we control for endogeneity between leverage and compensation decisions—the CEO is likely to have substantial influence over both—by using 2SLS regression. Results are consistent with our main results.

4 Empirical Results

4.1 Descriptive Statistics

Descriptive statistics of the dependent and independent variables are presented in Table 1. The sample average (mean) net *debt issue* and net *share issue* are about 1.6% and 0.3% of total assets respectively. These figures suggest that the amount of total proceeds from debt issue is much higher than that of share issue. The average *Vega* and *Delta* are $121,618 and $763,205 respectively. Hence, executive stock options do provide substantial incentive for CEOs to increase equity return volatility. These figures are comparable to the mean values of *Vega* and *Delta* reported in Liu and Mauer (2011) and Chava and Purnanandam (2010).

[Insert Table 1 here]

The average long-term leverage of the sample is 18.63% and average cash is 14.21% of total assets. This finding indicates that the firms in the sample on average have enough cash to pay

[7]In the literature, most studies define security issuance or repurchase as instances where firms wither issue or repurchase at least 5% or 10% of total assets. These studies either cover a long period or use gross issuance or repurchases and therefore, even at 5% or 10% of total assets, the sample size remains large. In our study, we use net security issuances and repurchases covering a period of only 15 years. As a result, when we use net security issuance or repurchases 5% of total assets, only a small sample size remain which, we believe, does not represent the issuance and repurchase behavior of the entire sample.

off most of their long-term debt. The average cash holding is also more than average cash flow (13.93% of total assets) for our sample firms. We find that the market to book (*MB*) ratio of the sample is 1.88. This mean value is consistent with Francis et al. (2011) who report in their paper that the average Tobin's Q is 1.87. The mean value of tangible assets (*GPPE*) is 55% of total assets. On average, R&D (*RD*), capital expenditures (*capex*), and total cash dividend payouts (*dividend*) are 3.6%, 6.5% and 1.06% respectively.

4.1.1 Sensitivity of share and debt issues based on 4 quartiles of Vega and leverage

Table 2a illustrates the differences in mean debt issues undertaken by CEOs with high *Vega* and CEOs with low *Vega* after controlling for different levels of leverage ratios. We create 16 portfolios based on four quartiles of *Vega* and four quartiles of leverage. As can be seen from Table 2a, in firms with low leverage (LL1), as risk-taking incentives increase from low *Vega* (V1) to high *Vega* (V4), the mean net debt issue increases monotonically. The difference in the mean debt issue between low *Vega* and high *Vega* is 1.02% of total assets. This difference is statistically significant at the 1% level which suggests that higher *Vega* indeed encourages CEOs to increase debt ratios. On the other hand, debt issuance decreases steadily for the CEOs with high *Vega* when the leverage increases from low to high quartile. For instance, when the CEOs have high *Vega*, the difference in the mean net debt issue between low-levered firms and the high-levered firms is 1.64% of total assets, implying that, on average, high *Vega* CEOs in low-levered firms issue 1.64% more debt compared to high *Vega* CEOs in high-levered firms. These two results imply that *Vega* encourages CEOs to take on more risk by issuing more debt but this risk-taking behavior of the CEOs is conditional on firm leverage and is not as apparent when the leverage is high. In contrast, when CEOs have low *Vega* we find that there is no statistically significant difference in debt issuance decisions between low-levered and high-levered firms. This finding suggests that when *Vega* is low, various levels of debt ratio do not significantly affect CEO debt issuance decisions.

[Insert Table 2a here]

Similarly, we use 16 portfolios to test differences in share issuance between quartiles of CEO *Vega* interacted with quartiles of leverage. As can be seen from Table 2b, in low-levered firms (LL1), low *Vega* CEOs (V1) issue shares that represent about 2% of total assets while the high *Vega* CEOs (V4) repurchase shares amounting to 1.92% of total assets (as indicated by the negative coefficient). This finding implies that in low-levered firms, low *Vega* CEOs decrease leverage by issuing shares while high *Vega* CEOs increase leverage by repurchasing shares. This difference in share issuance between a low *Vega* CEO and a high *Vega* CEO is statistically significant at the 1% level. It is useful to recall from Table 2a that, for low *Vega* firms, the volumes of debt issues are not significantly different between high- and low-levered firms. However, the findings are different for equity issues: as leverage increases, equity issues increase (or equity repurchases decrease) for both high and low *Vega* firms.

[Insert Table 2b here]

4.2 Correlations

The Pearson correlation matrix between the pairs of dependent and independent variables are presented in Table 3. We find that log of *Vega* is positively (insignificant) correlated with debt issuance and negatively correlated with share issuance. The correlation finding between share issuance and *Vega* is not surprising because share issuance does not increase leverage or firm risk, and therefore we see a negative correlation between these two variables. We also find that *Vega* is positively correlated with leverage. Since, debt issuance increases leverage, this is also consistent with our argument that *Vega* positively affects debt issuance. However, we find that

Delta is negatively correlated with leverage: pay-for-performance sensitivity (*Delta*) makes managers risk averse. We also find that log of (1+ *Vega*) and (1+*Delta*) are positively correlated with sales, market to book ratio, cash flow and dividend. The correlation between the log of *Vega* and *Delta* is 0.57. To avoid multicollinearity concerns, we also include these variables one at a time in our regressions.

[Insert Table 3 here]

4.2 Regression Results

4.2.1 OLS regression results:

Who Issues debt? The relation between debt issue and Vega

We present the results of OLS regressions for testing Hypotheses 1a in Table 4. The dependent variable is *debt issue* and the main independent variable is *Vega*. Column 1 shows that *Vega* is positively associated with *debt issue*. Columns 2-5 include control variables and show that the coefficient for *Vega* remains positive. Thus, CEOs with higher *Vega* issue more debt when external financing is required. This finding is consistent with Albring et al. (2011) and Dong et al. (2010). Columns 3-5 test the effect of *Vega* on *debt issue* while controlling for *Delta*. *Delta* has little impact on *debt issue*; however, the positive association of *Delta*, although insignificant, is consistent with Albring et al. (2011) and Meneghetti (2012).

[Insert Table 4 here]

In Table 4, the estimates of other control variables are also significant. Prior year leverage is negatively associated with *debt issue*, which suggests that lower-levered firms issue debt and higher-levered firms avoid issuing debt. Using *sales* as a proxy for firm size, we find smaller firms issue more debt. Likewise, firms with higher *capex*, higher prior year *MB*, *Cashflow*[8], and lower *cash* reserves issue more debt. The positive effect of *Cashflow* on *debt issue* implies that

[8]When we use current year *Cashflow* we find that it has a negative association with debt issuance.

profitable firms are able to raise debt at a lower cost. *MB* can represent better growth opportunities, so higher *MB* firms may need more debt financing to meet their growth needs. Here, *MB* does not represent equity mispricing, because equity overvaluation should lead to issuance of equity (Loughran and Ritter, 1995) rather than debt.

How does Vega influence debt issues in a high-levered firm?

In Table 5 we test hypothesis 1b. We present regression results to show whether *Vega* encourages managers to take excessive risk. As Jensen and Meckling (1976) argue, compensation incentives are designed to align managers' interests with those of shareholders. We argue that such incentives are likely to dissuade managers from carrying out excessive risk taking activities that are detrimental to firm value. If leverage is already high, lenders being aware of CEOs risk-taking behavior would prevent them from increasing leverage further. Therefore the interaction term between *Vega* and lagged *high_leverage*, which tests the effect of *Vega* in the presence of high leverage, should be negative. Consistent with our expectation, we find that the interaction term has a negative coefficient. Furthermore, the sum of the coefficients of *Vega* and the interaction term is not significantly different from zero, which implies that *Vega* has no effect on debt issues in high-levered firms. This finding suggests that although *Vega* encourages CEOs to issue debt to increase leverage, the positive effect of *Vega* on debt issues diminishes when leverage is already high. Therefore, a higher *Vega* does not necessarily lead to excessively risky firm policies, which contradicts Dong et al. (2010), who contend that, even in over-levered firms, *Vega* induces managers to issue more debt and adopt excessively risky leverage policies. Our evidence suggests that in high-levered firms CEOs with a higher *Vega* avoids taking on excessive operational risks by not issuing more debt.

[Insert Table 5 here]

Who Issues Shares? The relation between share issues and Vega

In Table 6, we present results of OLS regressions for testing Hypotheses 2a. The dependent variable is *share issue* and the main independent variable is *Vega*. Column 1 shows that *Vega* is negatively associated with *share issue*, and the rest of regressions report similar results. This result is consistent with our argument that risk-taking incentives (*Vega*) have a negative effect on share issues. Pay-performance sensitivity (*Delta*) is included in the last four columns. We find that while *Vega* impacts *share issue* negatively, *Delta* has a positive influence.

[Insert Table 6 here]

The estimates of control variables are also significant. For instance, prior leverage is positively associated with *share issue*. In addition, we find that firms that are smaller in size, have higher *MB*, lower *cashflow*, lower *cash* holdings, higher *capex*, higher *RD*, and higher *GPPE* issue more shares. These findings are consistent with theory and previous empirical evidence (McLean, 2011). We also find that *Dividend* payers issue fewer shares.

How does Vega influence share issues in a high-levered firm?

In Table 7, we test hypothesis 2b. As in the case of *debt issue*, we introduce the interaction term between *Vega* and lagged *high_leverage*. We include this term to investigate the effect of *Vega* on share issues in a firm that already has high leverage. We argue that, in order to undertake a risky but value-increasing project, CEOs with higher *Vega* issue shares when the leverage is high because at that point issuing debt will either be costly for them due to high risk of financial distress or will be prevented by lenders. However, if the project has a positive NPV, the CEOs with higher *Vega* will undertake the project by issuing shares. Thus, we expect that the interaction term to have a positive effect on *share issue*. Consistent with our expectation, we find that the interaction term has a positive coefficient. However, when we test the sum of the coefficients of

Vega and the interaction term using an F-test, we find the sum is negative and significantly different from zero. Therefore, in high-levered firms *Vega`s* negative effect on *share issue* does not alter.

[Insert Table 7 here]

4.2.2 Logistic regression results

Who is likely to issue debt? The relation between debt issuance and Vega

In Table 8, we present the logistic regression results of *debt issuance*. *Debt issuance* is a dummy variable that equals one if net debt issuance is at least 1% of total assets. Column 1 presents the impact of *Vega* on *debt issuance.* The coefficient for *Vega* is significantly positive, implying CEOs with higher *Vega* are more likely to issue debt. In Column 2 we include firm specific fundamentals such as *sales*, *leverage*, *MB*, *cashflow* and *capex*. We find the coefficient of *Vega* still remains positive and significant. In Column 3, controlling for *Delta* does not change the impact of *Vega* on *debt issuance*. However, *Delta* does not significantly affect *debt issuance*.

[Insert Table 8 here]

In Table 5, we found that the presence of high leverage weakens the positive relation between *Vega* and the amount of debt issued. To test if high leverage also affects the likelihood of issuing debt, we consider the interaction term between *Vega* and lagged *high_leverage*. In Table 9 we find the coefficient of the interaction term is negative. This finding implies that the effect of *Vega* on the likelihood of issuing debt is diminished for highly leveraged firms. From this evidence we can infer that when existing leverage is high, CEOs with higher *Vega* fail to issue debt for new projects due to lenders' monitoring. We also carry out a chi-square test and find that the overall influence of *Vega* in highly levered firms is not statistically significant. In general, these results are similar to those of OLS estimates.

[Insert Table 9 here]

Who is likely to issue shares? The relation between share issuance and Vega

In Table 10, we present the logistic regression results of share issuance. Here share issuance equals one if net share issuance is 1% or more of total assets, zero otherwise. The results presented in the 5 columns test Hypothesis 2a. In Column 1 we include only *Vega* and find that the coefficient of *Vega* is insignificantly negative. After controlling for *Delta* and factors such as *leverage, MB, cashflow* and others, the coefficient of *Vega* remains negative and strongly significant in column 3, 4 and 5. We also find that the firms that have higher *MB* (growth opportunities), *capex*, *RD*, and lower cash as well as *cashflow* are more likely to issue shares.

[Insert Table 10 here]

We hypothesize that higher *Vega* CEOs tend to avoid share issuance, but if leverage is already high, then they will issue shares to undertake projects. We expect the coefficient of the interaction term between *Vega* and prior year *high_leverage* to be positive. In Table 11, we present the results of the interaction term, which is positive but not significant. Joint test between the coefficient of *Vega* and the interaction term shows that the combined effect of *Vega* on share issuance remains negative. From this evidence, it appears that high leverage fails to alter the negative impact of *Vega* on share issuance.

[Insert Table 11 here]

Who is likely to retire debt? The relation between debt retirement and Vega

Corporations often change their capital structures by retiring debt. Since *Vega* induces higher leverage but retiring debt reduces it, we expect *Vega* to have a negative impact on debt retirement. From the sample evidence in all of the 5 columns of Table 12, we find the coefficient of *Vega* is negative, suggesting CEOs with higher *Vega* are less likely to retire debt. *Delta* also negatively affects the likelihood of *debt retirement*. As for other control variables, our sample evidence shows that firms with higher *sales*, *industry_adjusted_leverage*, and *GPPE* but lower *MB* and *capex* tend to retire debt.

[Insert Table 12 here]

Vega's role in debt retirement could also be different for high-levered and low-levered firms. Hence, we introduce the interaction term between *Vega* and prior year *high_leverage*. We expect the interaction term to be positive for high-levered firms because lender's pressure will diminish the negative influence of *Vega* on *debt retirement.* In Table 13, we find the interaction term has a positive and significant coefficient suggesting that influence of *Vega* on *debt retirement* in high-levered firms is likely to be different from its influence in low-levered firms. We conduct a chi-square test to examine if the coefficient of *Vega* and the coefficient of the interaction term are jointly significant. We find that they are not jointly significant, implying *Vega* has no effect on *debt retirement* among highly levered firms, so the influence of high leverage suppresses the negative impact of *Vega* on *debt retirement*.

[Insert Table 13 here]

Who is likely to repurchase shares? The relation between share repurchase and Vega

Share repurchase is a dummy variable that equals one if net share repurchase is at least 0.5% of total asset, zero otherwise. Columns 1-5 of Table 14 test hypothesis 4a. In column 1, only *Vega* is included. The significantly positive coefficient of *Vega* is consistent with our hypothesis that higher *Vega* CEOs are likely to repurchase shares. In Column 2, we include prior year explanatory variables such as *sales, MB, leverage, cashflow,* and current year *capex*. The coefficient still remains positive and significant. In Column 3, we include *Delta*, which does not significantly influence *share repurchase*, but the coefficient of *Vega* still remains significantly positive. In

Columns 4 and 5, we include more explanatory variables and find that the positive influence of *Vega* does not change, suggesting that a higher *Vega* induces managers to repurchase shares to increase firm risk by increasing leverage. Regarding other control variables, we find that while *sales, cashflow, and cash*, have positive impact on the likelihood of share repurchase, *leverage, capex, RD, MB* and *GPPE* have a negative impact.

[Insert Table 14 here]

To test hypothesis 4b we investigate the influence of *Vega* on share repurchase in high-levered firms. The regressions in Table 15 include an interaction term between *Vega* and prior year *high_leverage* dummy to investigate this effect. We expect the coefficient of this interaction term to be negative. However, we find that interaction term is negative but not significant, which implies that even in high-levered firms CEOs with higher *Vega* continue to repurchase shares. Joint test also shows that the combined effect of *Vega* and the interaction between *Vega* and *high_leverage* is significantly positive. This finding also suggests that by repurchasing shares CEOs with a higher *Vega* pursue excessively high leverage policy which increases financial risks. For other explanatory variables, coefficient signs remain the same and the significances also remain similar to the evidence we have found in Table 14.

[Insert Table 15 here]

5 Robustness Checks

In unreported regressions, we use various definitions of high leverage. For instance, high leverage is also defined as when a firm's leverage belongs to the top quartile of entire sample leverage or top quartile of industry adjusted leverage for the sample period. Moreover, we use interaction term between industry adjusted *Vega* and leverage as well as between *Vega* and *industry_adjusted_leverage*, and so forth. We find that in all of these cases our findings do not change.

In Table 16, we define over-levered firms if the firms' long-term leverage is above their target leverage. We estimate the target leverage based on firm fundamentals. Our target debt ratio model is built on Rajan and Zingales (1995), Hovakimian et al. (2001) and Dong et al. (2010). Using model 3, we regress long-term leverage on firm fundamentals and store the predicted values which are proxies of capital structure for each firm for each year. By defining over-leverage based on this target debt ratio, we continue to find that over-leverage mitigates the effect of *Vega* on debt issuance and debt retirement but it has no power to diminish *Vega*'s effect on share issuance and repurchases. When we conduct chi-square test, we find that the coefficients of *Vega* and the interaction term combined are insignificant for debt issuance and retirement but significant for share issuance and repurchase. These findings about the effect of *Vega* on external financing in the over-levered firms are consistent with our earlier presented results where we use *high_leverage* which is defined based on industry adjusted leverage.

$$\begin{aligned} Leverage = \alpha_0 + \beta_1 Size + \beta_2 Cashflow + \beta_3 MB + \beta_4 GPPE + \beta_5 RD \\ + Year\ Dummies + Industry\ Dummies + \varepsilon \end{aligned} \quad (3)$$

[Insert table 16 about here]

As part of the robustness checks, in the rest of the tables we use industry unadjusted leverage, high_leverage and low_leverage to examine if our results are sensitive to other measures of leverage. In Table 17, we examine the effect of *Vega* on debt issues in the presence of both high leverage and low leverage. We use both $Vega_t$ * $high\_leverage_{t-1}$ and $Vega_t$ * $low\_leverage_{t-1}$ interaction terms to investigate the effect. Although the evidence is weak, we find that while the coefficient of $Vega_t$* $high\_leverage_{t-1}$ is negative and opposite to the coefficient of *Vega* itself, the sign of the coefficient of $Vega_t$* $\text{low\_leverage}_{t-1}$ is positive and corresponds with the sign of the coefficient of *Vega*. We also conduct joint F-test between the coefficients of *Vega* and $Vega_t$

* $low\_leverage_{t-1}$ and find that the effect of *Vega* on debt issues in low-levered firms is significant. On the other hand, when we conduct joint test between the coefficients *Vega and* $Vega_t$ * $high\_leverage_{t-1}$ we do not find any significant result. This finding suggests that, when leverage is low, a higher *Vega* causes a higher amount of debt issues However, when the leverage of a firm is high, it is not the case. Therefore, only high leverage plays an important role in mitigating the impact of *Vega* on debt issuance. In Table 18, we show that while *high_vega* (*low_vega*) affects debt issues positively (negatively), it affects share issues negatively (positively). The impact of *high_vega* and *low_vega* on security issues indicate that CEOs with *high_vega* increase leverage but CEOs with *low_vega* avoid taking risks by not increasing leverage. We also find that high-levered firms tend to avoid issuing debt whereas low-levered firms issue debt. And the results are opposite for share issues.

[Insert table 17 about here]
[Insert table 18 about here]

Although we use lagged leverage to mitigate any concern of causality or endogeniety, for robustness, we conduct 2SLS. In the 2SLS in Table 18, we regress *Vega* on contemporary leverage, lagged leverage and other control variables in the first-stage regression. In the second regression, we regress *debt issue* on the estimated *V*ega from the first-stage regression. We find that the relationship between debt issue and *Vega* still holds. The coefficient of *Vega* still remains positive and strongly significant (at a 1% level). In the first stage, we also find that prior year leverage does not have any significant impact on *Vega*. Therefore, there is no concern of causality between current year *Vega* and prior year leverage. In addition to the previously used control variables, we use three CEO-specific variables such as CEO wealth or total compensation, cash compensation, and age of the CEOs. We find that cash compensation is negatively related to debt issuance whereas age is positively related to debt issuance, suggesting that CEOs with more years of experience tend issue more debt. Our finding regarding the negative effect of cash compensation on *debt issue* is consistent with the argument of Berger, Ofek, and Yermack. (1997). The authors consider cash compensation as a proxy for risk aversion. However, Guay (1999) argues that a higher amount of cash compensation make CEOs less risk averse because it allows them to be better diversified by making outside investments.

[Insert table 19 about here]

6 Conclusions

The objective of managerial compensation incentives is to align managers' interests with those of shareholders. Risk-taking incentives (*Vega*) measured by the sensitivity of CEO wealth to stock return volatility encourage CEOs to undertake risky firm policies such as increasing leverage. However, according to Jensen's (1986) controlling hypothesis, leverage disciplines managers. Hence, a natural question arises—does *Vega* effectively increase firm risk in highly levered firms? In other words, does *Vega* lead to excessively risky leverage policy? We shed light on this question by investigating the relation between *Vega* and four avenues of external financing decisions: debt and share issuances and repurchases. Each of these avenues affects capital structure or leverage directly. Our results show that while, in general, *Vega* is positively (negatively) associated with debt (share) issuance, it is negatively (positively) associated with the debt retirement (share repurchase). However, in high-levered firms, *Vega* does not significantly affect either debt issuance or debt retirement. But for equity issuance and repurchases high leverage does not seem to alter the impact of *Vega*: CEOs are likely to continue repurchasing shares and avoid issuing them even when leverage is high. And our findings are consistent with the theory that *Vega* encourages managers to increase firm risk and the degree of leverage of a firm. Our study has important implications for corporate finance discipline: 1) *Vega* acts as a risk-taking incentive for under-levered firms, 2) In high-levered firms *Vega* does not encourage CEOs to take on more debt to avoid potential excessive operational risks arising from a new project but it continues to induce CEOs to repurchase shares which may lead to excessive non-operations risks, and (3) The fact that high-levered firms avoid issuing debt but are likely to continue repurchasing shares suggests CEOs with a higher *Vega* do not seem to follow target debt ratios.

Appendix

Vega and *Delta* construction:

Vega is measured by the sensitivity of CEO wealth (in dollars) from holding stock options to a 1% change in the annualized stock return volatility. .

Delta, which measures performance incentives, is defined as the change in value (in dollars) of CEO wealth (value of options, restricted stock grants, and stocks) for a 1% change in stock price.

For the computation of *Vega* and *Delta* we use the method described by Core and Guay (2002) which is based on the Black-Scholes [1973] formula modified to include the dividend effect.

$$\text{Vega} = (\text{total \# of options CEO owns}) * \partial(\text{Black-Scholes option value})/\partial(\text{Stock return volatility}) * 0.01$$

where

$$\partial(\text{Black-Scholes option value})/\partial(\text{Stock return volatility}) = e^{-dT}\ N'(Z) P \sqrt{T}$$

$$\text{Delta (options)} = (\text{number of options CEO owns}) * e^{-d*T}\ N(Z) * P * 0.01$$

$$Z = [\log(P/X) + T(i - d + \sigma^2/2)]/\sigma\sqrt{T}$$

Where N′ = the normal density function

N = the cumulative density function

P = market price of the underlying stocks

X = exercise price of options

σ = expected stock return volatility over life of option

i = risk-free interest rate

T = time to maturity of the option calculated in years

d = expected dividend rate over the life of options

From ExecuComp we obtain the market price of the underlying stocks, the exercise price of the options, and the time to maturity of the options. From Compustat we collect dividend yields which are used as a proxy for expected dividend rate over life of options. Dividend yield is measured as dividend payment per share over market price of the share. We measure the proxy of expected stock return volatility over life of options by annualizing the volatility of daily stock returns- the standard deviation of daily stock returns times √252. We collect 10-year Treasury constant maturity rate at fiscal year end from Federal Reserve Bank as a proxy of risk-free interest rate (see Tong, 2010). From the option expiration date reported in ExecuComp, we calculate the time to maturity of the options. With these items we can calculate both *Vega* and *Delta* of newly granted options. However, the time to maturity and the exercise price of the previously granted options are not directly available in ExecuComp. Therefore, we undertake the following steps to measure the time to maturity and the exercise price.

First, we divide the previously granted options as exercisable options and un-exercisable options (Core and Guay, 2002, and Coles, Daniel and Naveen, 2006). Then we find the exercise price and the time to maturity for each of them separately.
To compute the exercise price of exercisable options we use the following approach.

$$\begin{aligned}&\textit{Average exercise price of exercisable options} =\\&\textit{market price of the underlying stock} - \textit{in the money value of exercisable options} /\\&\textit{number of exercisable options}\end{aligned}$$

We estimate the time to maturity of exercisable options as T – 4 years (see Core and Guay, 2002). Similarly, the average exercise price for the un-exercisable options is estimated as the current price of the underlying stock minus in the money value of un-exercisable options minus the value of newly granted options over the number of un-exercisable options minus the number of newly granted options. The time to maturity of un-exercisable options is computed as the time to maturity of the current year's options grants (T) minus one year. Now, we can compute the Black-Scholes option value, *Delta*, and *Vega* of previously granted options as well.

$$\textit{Vega} = \textit{vega of newly granted options} + \textit{vega of previously granted options}$$

$$\textit{Delta of options} = \textit{delta of newly granted options} + \textit{delta of previously granted options}$$

Since, Guay (1999) finds that the value of restricted stock and shares is insignificant compared to the *Vega* from options, we ignore them in our *Vega* calculation.

$$\text{Delta of stock/restricted stocks} = \text{number of stocks/restricted stocks} * \text{price} * 0.01$$

$$\begin{aligned}\textit{Delta} = \textit{delta of } (&\textit{newly granted options} + \textit{previously granted options} + \textit{stocks}\\&+ \textit{restricted stock holdings})\end{aligned}$$

References

Albring, Susan M., Khurana, Inder K., Nejadmalayeri, Ali, Pereira, Raynolde, 2011. Managerial compensation and the debt placement decision. *Journal of Corporate Finance* 17, 1445-1456.

Armstrong, Christopher S., Vashishtha, Rahul, 2012. Executive stock options, differential risk-taking incentives and firm value. *Journal of Financial Economics*, 104, 70-88.

Berger, P., Ofek, E., Yermack, D., 1997. Managerial entrenchment and capital structure decisions. *Journal of Finance* 52, 1411–1438.

Bernanke, Ben, 1989. Is there too much corporate debt? *Business Review* pp. 1-13.

Bhargava, Alok, 2011. Executive compensation, share repurchase and investment expenditures: econometric evidence from US firms. *Review of Quantitative Financial and Accounting*.

Brockman, Paul, Martin, Xiumin, Unlu, Emre, (2010). Executive compensation and the maturity structure of corporate debt. *The Journal of Finance* 65, 1123-1161.

Chance, Don M., Yang, Tung-Hsiao, 2011.The tradeoff between compensation and incentives in executive stock options. *Quarterly Journal of Finance* 1, 733-766.

Chava, Sudheer, Purnanandam, Amiyatosh, 2010. CEOs versus CFOs: Incentives and corporate policies. *Journal of Financial Economics* 97, 263-278.

Cohen, R., Hall, B., Viceira, L., 2000. Do executive stock options encourage risk-taking? Working Paper. *Harvard Business School*.

Coles, Jeffery L, Daniel, Naveen D., Naveen, Lalitha, 2006. Managerial incentives and risk taking. *Journal of Financial Economics* 79, 431-468.

Core, J., Guay, W., 1999. The use of equity grants to manage optimal equity incentive levels. *Journal of Accounting and Economics* 28, 151–184.

Core, J., Guay, W. R., 2002. Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *Journal of Accounting Research* 40, 613-630.

DeAngelo, H., DeAngelo, L., Stulz, R., 2010. Seasoned equity offerings, market timing, and the corporate lifecycle. *Journal of Financial Economics* 56, 3–28.

Dong, Z., Wang, C., Xie, F., 2010. Do executive stock options induce excessive risk taking? *Journal of Banking and Finance* 34, 2518-2529.

Eisdorfer, A., Giaccotto, C., White, R., 2013. Capital structure, executive compensation, and investment efficiency. *Journal of Banking and Finance* 37, 549-562.

Faccio, M., Masulis, R.W., 2005. The Choice of Payment Method in European Mergers and Acquisitions. *Journal of Finance* 60, 1345-1388.

Fama, Eugene F., French, Kenneth. R., 2005. Financing decisions: who issues stock? *Journal of Financial Economics* 73, 229–269.

Francis, Bill, Hasan, Iftekhar, and Sharma, Zenu, 2011. Leverage and growth: Effect of stock options. *Journal of Economics and Business* 63, 558-581.

Fried, Jesse M., 2011. Share repurchases, equity issuances, and the optimal design of executive pay. *Texas Law Review* 89, 1112-1146.

Frank, M.Z., Goyal, V.K., 2009. Capital structure decisions: which factors are reliably important? *Financial Management* 38, 1-37.

Gatchev, Vladimir A., Spindt, Paul A., and Tarhan, *Vega*, 2009. How do firms finance their investments? The relative importance of equity issuance and debt contracting costs. *Journal of Corporate Finance*, 15, 179-195.

Gilson, S.C., 1997. Transactions Costs and Capital Structure Choice: Evidence from Financially Distressed Firms. *Journal of Finance* 52, 161-196.

Gormley, Todd A., Matsa, David A., Milbourn, Todd, 2012. CEO compensation and corporate risk-taking: Evidence from a natural experiment. Working paper. Northwestern University

Guay, W., 2000. The sensitivity of CEO wealth to equity risk: an analysis of the magnitude and determinants. *Journal of Financial Economics* 53, 43-71.

Hovakimian, A., Opler, T., Titman, S., 2001. The Debt-Equity Choice. *Journal of Financial and Quantitative Analysis* 36, 1-24.

Jensen, Michael C., Meckling, William H., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics* 3, 305-360.

Jensen, Michael C., 1986. Agency cost of free cash flow, corporate finance, and takeovers. *The American Economic Review*, 76(2), 323-329.

Jensen, Michael C., Murphy, Kevin J., 1990. Performance pay and top-management incentives. *Journal of Political Economy* 98, 225-264.

John, Teresa, A. John, Kose, 1993. Top-management compensation and capital structure. *The Journal of Finance* 48, 949-974.

Jong, Abe de, Verbeek, Marno, Verwijmeren, Patrick, 2011. Firm's debt-equity decisions when the static tradeoff theory and the pecking order theory disagree. *Journal of Banking and Finance* 35, 1303-1314.

Kahle, K., 2002. When a buyback isn't a buyback: open market repurchases and employee options. *Journal of Financial Economics* 63, 235–261

Knopf, John D., Jouahn Nam, John H. Thornton Jr., 2002. The volatility and price sensitivities of managerial stock option portfolios and corporate hedging. *The Journal of Finance* 57, 801-812.

Lewellen, Katharina, 2006. Financing decisions when managers are risk averse. *Journal of Financial Economics* 82, 551-589.

Lin, Hsuan-Chu, Chou Ting-Kai, Wang, Wen-Gine, 2012. Capital Structure and executive compensation contract design: A theoretical and empirical analysis. *Journal of Banking & Finance* 36, 209-224.

Loughran, T, Ritter, J., 1995. The new issue puzzle. *Journal of Finance* 50, 23–51.

Liu, Yixin, Mauer, David C., 2011. Corporate cash holdings and CEO compensation incentives. *Journal of Financial Economics* 102, 183-198.

Low, Angie, 2009. Managerial risk-taking behavior and equity-based compensation. *Journal of Financial Economics* 92, 470-490.

Meneghetti, Costanza, 2012. Manegerial Incentives and the choice between public and bank debt. *Journal of Corporate Finance* 18, 65-91.

McLean, R. David, 2011. Share issuance and cash savings. *Journal of Financial Economics* 99, 693-715.

Myers, S.C., 1984. The capital structure puzzle. *Journal of Finance* 39, 575-592.

Myers, S., Majluf, N., 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13, 187–221.

Ross, Stephen A., 2004. Compensation, incentives, and the duality of risk aversion and riskiness. *Journal of Finance* 59, 207-225.

Rajan, R. Zingales, L., 1995. What do we know about capital structure: Some evidence from international data. *Journal of Finance* 50, 1421-1460.

Shaw, Kenneth W., 2011. CEO Incentives and the cost of debt. *Review of Quantitative Finance and Accounting*.

Skinner, D.J., 2008, The evolving relation between earnings, dividends, and stock repurchases. *Journal of Financial Economics* 87, 582-609.

Tong, Zhenxu, 2010. Risk reduction as a CEO's motive for corporate cash holdings. *Journal of Business Finance and Accounting* 37, 1248-1280.

Table 1: Summary Statistics

This table presents summary statistics of the dependent and control variables. *Debt issue* is the proceeds from gross debt issuance minus the amount of gross debt retired. *Share issue* is the proceeds from common and preferred share issuance minus gross share repurchase. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. *Sales* is log(1 + proceeds from sales). *Leverage* is the ratio of long-term debt over book value of total assets. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. The sample covers the period between 1992 and 2006 inclusive.

Item	N	Mean	Std	P25	P50	P75
Debt issue	15,623	0.0162	0.0854	-0.0152	0	0.0300
Share issue	15,623	0.0037	0.0794	-0.0139	0.0007	0.0096
Vega	15,623	121,618	237,373	17,816	47,851	122,756
Delta	15,623	763,205	2,111,103	85,296	216,463	588,345
Sales	15,623	7.0482	1.6310	5.9912	7.0000	8.0801
Leverage	15,578	0.1863	0.1625	0.0307	0.1677	0.2905
MB	15,556	1.8808	1.5498	0.9605	1.3799	2.1613
Cashflow	15,567	0.1393	0.1057	0.0936	0.1425	0.1960
Capex	15,468	0.0648	0.0589	0.0278	0.0489	0.0815
GPPE	15,546	0.5496	0.3611	0.2682	0.4654	0.7607
Cash	15,617	0.1420	0.1733	0.0194	0.0658	0.2037
RD	15,623	0.0360	0.0610	0	0.0042	0.0481
Dividend	15,623	0.0106	0.0163	0	0.0021	0.0160

Table 2: Portfolios of debt issue and share issue based on four quartiles of Vega and four quartiles of leverage

Table 2a

Portfolios of *debt issuance* based on four quartiles of *Vega* and four quartiles of *leverage*

V1, V2, V3 & V4 represent 1st, 2nd, 3rd & 4th quartiles of *Vega* respectively. LL1, LL2, LL3 & LL4 represent 1st, 2nd, 3rd & 4th quartiles of lagged leverage respectively**.**

Mean *debt issue*					
Vega /Leverage Quartiles	LL1	LL2	LL3	LL4	Difference between LL1 and LL4[a]
V1	1.60%**	1.27%***	1.40%***	1.72%***	0.12%
V2	2.00%**	2.36%**	1.40%***	1.20%***	-
V3	2.15%**	2.10%**	1.89%**	0.60%***	-
V4	2.62%**	1.79%**	1.70%**	0.98%**	-1.64%**
Difference between V1 and V4[a]	1.02%**	-	-	-0.74%	

[a] We calculate the difference only between 1st quartile and 4th quartile (between two extremes)

Table 2b

Portfolios of *share issuance* based on four quartiles of *Vega* and four quartiles of *leverage*

V1, V2, V3 & V4 represent 1st, 2nd, 3rd & 4th quartiles of *Vega* respectively. LL1, LL2, LL3 & LL4 represent 1st, 2nd, 3rd & 4th quartiles of lagged leverage respectively**.**

Mean *share issue*					
Vega /Leverage Quartiles	LL1	LL2	LL3	LL4	Difference between LL1 and LL4[a]
V1	1.99%**	1.31%***	1.63%***	2.48***	0.49%**
V2	1.10%***	0.96%***	0.51%***	1.19%***	-
V3	0.37%***	-1.11%**	-0.45%***	0.84%***	-
V4	-1.92%**	-2.21%**	-1.00%**	-0.57%***	-1.35%**
Difference between V1 and V4[b]	-3.91%**	-	-	-3.05%	

[b] We calculate the difference only between 1st quartile and 4th quartile (between two extremes)

Table 3: Pearson correlation

This table presents correlation coefficients of the dependent and control variables. *Debt issue* is the proceeds from gross debt issuance minus debt retired. *Share issue* is the proceeds from common and preferred share issuance minus share repurchase. *Vega* is the change in CEOs wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is log (1+proceeds from sales). *Leverage* is the ratio of long-term debt over book value of total assets. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is total cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. The sample period is 1992-2006 inclusive.

	debt issue$_t$	*share issue$_t$*	log of (1+*Vega* $_t$)	log of (1+*Delta* $_t$)	*Leverage* $_{t-1}$	*Sales* $_{t-1}$	*MB* $_{t-1}$	*Capex* $_t$	*Cashflow* $_{t-1}$	*Cash* $_{t-1}$	*GPPE* $_{t-1}$	*RD* $_{t-1}$	*Dividend* $_{t-1}$
debt issue $_t$	1.00												
share issue $_t$	-0.05	1.00											
	(0.00)												
log of (1+*Vega* $_t$)	0.01	-0.15	1.00										
	(0.46)	(0.00)											
log of (1+*Delta* $_t$)	0.02	-0.05	0.57	1.00									
	(0.00)	(0.00)	(0.00)										
Leverage $_{t-1}$	-0.04	0.04	0.04	-0.04	1.00								
	(0.00)	(0.00)	(0.00)	(0.00)									
Sales $_{t-1}$	-0.05	-0.26	0.46	0.33	0.16	1.00							
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)								
MB $_{t-1}$	0.06	0.08	0.11	0.25	-0.25	-0.21	1.00						
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)							
Capex $_t$	0.11	0.04	-0.09	0.00	0.03	-0.05	-0.05	1.00					
	(0.00)	(0.00)	(0.00)	(0.77)	(0.00)	(0.00)	(0.00)						
Cashflow $_{t-1}$	0.03	-0.30	0.14	0.20	-0.10	0.27	0.24	0.20	1.00				
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)					
Cash $_{t-1}$	-0.01	0.13	-0.04	0.03	-0.36	-0.45	0.43	-0.09	-0.22	1.00			
	(0.39)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
GPPE $_{t-1}$	-0.00	-0.04	-0.02	-0.10	0.23	0.14	-0.21	0.43	0.15	-0.36	1.00		
	(0.83)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
RD $_{t-1}$	0.00	0.22	-0.01	-0.02	-0.24	-0.36	0.32	-0.10	-0.33	0.56	-0.24	1.00	
	(0.64)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Dividend $_{t-1}$	0.01	-0.17	0.12	0.02	-0.07	0.28	0.07	-0.04	0.29	-0.18	0.16	-0.14	1.00
	(0.15)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Table 4: The impact of Vega on debt issue

This table presents the OLS results of hypothesis 1a. *Debt issue* is the proceeds from gross debt issuance minus debt retired. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales. *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit *rating* of a firm is available, zero otherwise. *CEO Wealth* is the CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. t statistics are in parentheses.

Dependent variable- *Debt issue*

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Constant	0.008**	0.012*	0.01	0.012	0.032**
	(2.15)	(1.76)	(1.54)	(1.09)	(2.53)
Log(1+Vega)$_t$	0.001**	0.003***	0.003***	0.003***	0.004***
	(1.96)	(4.64)	(3.76)	(3.65)	(3.66)
Log(1+Delta)$_t$			0.001	0.001	0.001
			(0.66)	(0.68)	(0.82)
Industry_adjusted_leverage$_{t-1}$		-0.103***	-0.103***	-0.102***	-0.110***
		(-15.45)	(-15.42)	(-15.28)	(-16.23)
Log(1+Sales$_{t-1}$)		-0.004***	-0.004***	-0.003**	-0.005***
		(-4.31)	(-4.36)	(-4.05)	(-5.51)
MB$_{t-1}$		0.001**	0.001*	0.001	0.002***
		(1.99)	(1.86)	(1.55)	(2.97)
Cashflow$_{t-1}$		0.017*	0.017*	0.02*	0.015
		(1.68)	(1.67)	(1.92)	(1.44)
Capex$_t$		0.185***	0.184***	0.185***	0.191***
		(11.47)	(11.42)	(11.47)	(11.40)
RD$_{t-1}$				0.021	0.062***
				(1.07)	(3.01)
Rating$_{t-1}$				-0.004	-0.004
				(-0.42)	(-0.49)
Cash$_{t-1}$					-0.057**
					(-7.60)
GPPE$_{t-1}$					-0.007**
					(-2.11)
Log(CEO Wealth$_t$)					-0.000
					(-0.37)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	15,623	13,563	13,562	13,562	13,442
R-squared	15.4%	19.5%	19.5%	19.5%	19.8%

Table 5: The impact of Vega on debt issue in high-levered firms

This table presents the OLS results of hypothesis 1b. *Debt issue* is the proceeds from gross debt issuance minus the amount of gross debt retired. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year. *MB* is the ratio between market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is total cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if the credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels. t statistics are in parentheses. .

Dependent variable- *debt issue*

	(1)	**(2)**	**(3)**	**(4)**
Constant	0.02***	0.018**	0.02*	0.041***
	(2.91)	(2.56)	(1.76)	(3.21)
$Log(1+Vega)_t$	0.004***	0.004***	0.004***	0.004***
	(5.33)	(4.40)	(4.29)	(4.22)
$Log(1+Delta)_t$		0.001	0.001	0.001
		(0.96)	(0.98)	(1.08)
$High\_leverage_{t-1}$	-0.011*	-0.011*	-0.01*	-0.015**
	(-1.85)	(-1.81)	(-1.77)	(-2.51)
$Log(1+Vega)_t*High\_leverage_{t-1}$	-0.004***	-0.004***	-0.004**	-0.004**
	(-3.09)	(-3.13)	(-3.13)	(-2.60)
$Log(1+Sales_{t-1})$	-0.004***	-0.005***	-0.004**	-0.006***
	(-5.38)	(-5.46)	(-5.09)	(-6.22)
MB_{t-1}	0.002**	0.001**	0.001*	0.002***
	(2.32)	(2.48)	(1.78)	(2.88)
$Cashflow_{t-1}$	0.025***	0.025***	0.029***	0.026**
	(2.51)	(2.48)	(2.73)	(2.47)
$Capex_t$	0.184***	0.183***	0.184***	0.193***
	(11.37)	(11.31)	(11.36)	(11.49)
RD_{t-1}			0.027	0.058***
			(1.19)	(2.77)
$Rating_{t-1}$			-0.004	-0.005
			(-0.47)	(-0.56)
$Cash_{t-1}$				-0.048***
				(-6.40)
$GPPE_{t-1}$				-0.009***
				(-2.54)
$Log\ (CEO\ Wealth_t)$				-0.001
				(-0.72)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	13,563	13,562	13,562	13,442
R-squared	19.1%	19.1%	19.1%	19.3%

Table 6: The impact of Vega on share issue

This table presents the OLS results of hypothesis 2a. *Share issue* is the proceeds from common and preferred share issuance minus gross share repurchase. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is log (1+proceeds from sales). *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. t statistics are in parentheses.

Dependent variable- *share issue*

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Constant	0.032***	0.064***	0.055***	0.046***	0.060***
	(10.19)	(11.50)	(9.59)	(5.01)	(5.72)
Log(1+Vega)$_t$	-0.007**	-0.005***	-0.007***	-0.007***	-0.007***
	(-11.61)	(-7.13)	(-9.20)	(-9.85)	(-8.14)
Log(1+Delta)$_t$			0.004***	0.004***	0.005***
			(6.15)	(6.32)	(6.77)
Industry_adjusted_leverage$_{t-1}$		0.053***	0.054***	0.058***	0.046***
		(9.41)	(9.63)	(10.23)	(8.02)
Log(1+Sales$_{t-1}$)		-0.006***	-0.006***	-0.005***	-0.007***
		(-8.19)	(-8.88)	(-7.21)	(-9.20)
MB$_{t-1}$		0.005***	0.005***	0.004***	0.006***
		(9.72)	(8.59)	(6.55)	(9.13)
Cashflow$_{t-1}$		-0.143***	-0.144***	-0.123***	-0.135***
		(-17.04)	(-17.21)	(-13.92)	(-14.99)
Capex $_t$		0.087***	0.083***	0.089***	0.073***
		(6.37)	(6.06)	(6.55)	(5.18)
RD$_{t-1}$				0.128***	0.178***
				(7.53)	(10.18)
Rating$_{t-1}$				-0.003	-0.003
				(-0.45)	(-0.46)
Cash$_{t-1}$					-0.063***
					(-9.96)
GPPE$_{t-1}$					0.006**
					(2.05)
Dividend $_{t-1}$					-0.076
					(-1.22)
Log(CEO Wealth$_t$)					0.000
					(0.10)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	15,623	13,563	13,562	13,562	13,442
R-squared	27.5%	32.4%	32.6%	33.0%	33.7%

Table 7: The impact of Vega on share issue in high-levered firms

This table presents the OLS results of hypothesis 2b. *Share issue* is the proceeds from common and preferred share issuance minus gross share repurchase. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year.. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if the credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. t statistics are in parentheses.

Dependent variable-*Share issue*$_t$

	(1)	**(2)**	**(3)**	**(4)**
Constant	0.061***	0.052***	0.042***	0.058***
	(10.89)	(8.80)	(4.53)	(5.47)
Log(1+Vega)$_t$	-0.005***	-0.007***	-0.007***	-0.007***
	(-7.05)	(-8.90)	(-9.48)	(-8.29)
Log(1+Delta)$_t$		0.004***	0.004***	0.004***
		(5.93)	(6.09)	(6.55)
High_leverage$_{t-1}$	0.004	0.005	0.006	0.001
	(0.74)	(1.00)	(1.27)	(0.15)
*Log(1+Vega)$_t$*High_leverage$_{t-1}$*	0.002*	0.002	0.002	0.003**
	(1.74)	(1.52)	(1.47)	(2.09)
Sales $_{t-1}$	-0.005***	-0.006***	-0.005***	-0.007***
	(-7.51)	(-8.17)	(-6.51)	(-8.77)
MB$_{t-1}$	0.005***	0.005**	0.004***	0.006***
	(9.39)	(8.29)	(6.30)	(9.20)
Cashflow$_{t-1}$	-0.148***	-0.15***	-0.129***	-0.140***
	(-17.71)	(-17.89)	(-14.64)	(-15.63)
Capex $_t$	0.087***	0.083***	0.089***	0.072***
	(6.37)	(6.07)	(6.54)	(5.08)
RD$_{t-1}$			0.124***	0.180***
			(7.31)	(10.23)
Rating$_{t-1}$			-0.003	-0.003
			(-0.41)	(-0.44)
Cash$_{t-1}$				-0.068***
				(-10.77)
GPPE$_{t-1}$				0.007**
				(2.28)
Dividend$_{t-1}$				-0.103*
				(-1.65)
CEO Wealth $_t$				0.000
				(0.27)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	13,563	13,562	13,562	13,442
R-squared	32.2%	32.4%	32.7%	33.6%

Table 8: The impact of Vega on debt issuance

This table presents the logistic regression results of hypothesis 1a. *Debt issuance* is a dummy variable and equals one if the net debt issuance is at least 1% of total assets, zero otherwise. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Debt issuance*$_t$

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log(1+Vega)$_t$	0.046***	0.072***	0.083***	0.088***	0.085***
	(2.61)	(3.44)	(3.47)	(3.64)	(2.94)
Log(1+Delta)$_t$			-0.022	-0.023	-0.020
			(-0.98)	(-1.02)	(-0.87)
Industry_adjusted_leverage$_{t-1}$		-0.98***	-0.987***	-1.025***	-1.521***
		(-5.34)	(-5.38)	(-5.55)	(-7.85)
Log(1+Sales $_{t-1}$)		0.008	0.011	0.001	-0.075***
		(0.35)	(0.47)	(0.03)	(-3.02)
MB$_{t-1}$		-0.04**	-0.037*	-0.025	0.037*
		(-2.02)	(-1.85)	(-1.23)	(1.68)
Cashflow$_{t-1}$		0.599**	0.602**	0.388	-0.138
		(2.07)	(2.08)	(1.27)	(-0.12)
Capex$_t$		6.152***	6.173***	6.113***	6.293***
		(13.71)	(13.73)	(13.58)	(13.24)
RD$_{t-1}$				-1.316**	1.229*
				(-2.21)	(1.93)
Rating$_{t-1}$				-0.013	0.038
				(-0.06)	(0.16)
Cash$_{t-1}$					-3.216***
					(-13.68)
GPPE$_{t-1}$					-0.176*
					(-1.90)
Log(CEO Wealth$_t$)					0.030
					(0.96)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	14,108	12,133	12,132	12,132	12,013
Log-likelihood	-6,425	-5,351	-5,350	-5,348	-5,182
Chi-square	13	276	277	282	491

Table 9: The impact of Vega on debt issuance in high-levered firms

This table presents the logistic regression results of hypothesis 1b. *Debt issuance* is a dummy variable and equals one if the net debt issuance is at least 1% of total assets or else it takes a zero value. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is the total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Debt issuance*$_t$

	(1)	(2)	(3)	(4)
Log(1+Vega)$_t$	0.102***	0.11***	0.114***	0.106***
	(4.36)	(4.24)	(4.38)	(3.48)
Log(1+Delta)$_t$		-0.017	-0.018	-0.014
		(-0.77)	(-0.81)	(-0.63)
High_leverage$_{t-1}$	0.183	0.176	0.162	-0.020
	(1.17)	(1.13)	(1.04)	(-0.13)
*Log(1+Vega)t*High_leverage$_{t-1}$*	-0.12***	-0.118***	-0.117***	-0.094**
	(-3.12)	(-3.08)	(-3.06)	(-2.41)
Log(Sales$_{t-1}$)	-0.001	0.001	-0.009	-0.083***
	(-0.06)	(0.01)	(-0.40)	(-3.35)
MB$_{t-1}$	-0.039**	-0.035*	-0.025	0.036
	(-1.97)	(-1.83)	(-1.22)	(1.63)
Cashflow$_{t-1}$	0.687**	0.69**	0.485	0.135
	(2.39)	(2.40)	(1.60)	(0.43)
Capex $_t$	6.135***	6.152***	6.094***	6.305***
	(13.65)	(13.67)	(13.51)	(13.25)
RD$_{t-1}$			-1.269**	1.196*
			(-2.13)	(1.88)
Rating$_{t-1}$			-0.007	0.037
			(-0.03)	(0.16)
Cash$_{t-1}$				-3.145***
				(-13.18)
GPPE$_{t-1}$				-0.192***
				(-2.08)
Log(CEO Wealth$_t$)				0.024
				(0.76)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	12,133	12,132	12,132	12,013
Log likelihood	-5,348	-5,348	-5,345	-5,187
Chi-square	281	282	287	479

Table 10: The impact of Vega on share issuance

This table presents the logistic regression results of hypothesis 2a. *Share issuance* is a dummy variable and equals one if the net share issuance is at least 1% of total assets, zero otherwise. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Share issuance*$_t$

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log(1+Vega)$_t$	-0.000	0.039	-0.088***	-0.105***	-0.166***
	(-0.03)	(1.61)	(-3.16)	(-3.84)	(-4.79)
Log(1+Delta)$_t$			0.256***	0.261***	0.263***
			(9.97)	(10.14)	(10.05)
Industry_adjusted_leverage$_{t-1}$		0.519***	0.57***	0.689***	0.551***
		(2.52)	(2.74)	(3.27)	(2.56)
Log(1+Sales$_{t-1}$)		-0.231***	-0.269***	-0.225***	-0.236***
		(-8.48)	(-9.64)	(-7.87)	(-7.79)
MB$_{t-1}$		0.216***	0.182***	0.149***	0.150***
		(10.50)	(8.70)	(7.02)	(6.68)
Cashflow$_{t-1}$		-1.543***	-1.666***	-0.959***	-0.843***
		(-5.14)	(-5.51)	(-2.99)	(-2.58)
Capex $_t$		1.862***	1.691***	1.981***	2.148***
		(3.95)	(3.57)	(4.17)	(4.31)
RD$_{t-1}$				4.268***	4.638***
				(7.16)	(7.44)
Rating$_{t-1}$				-0.028	-0.053
				(-0.10)	(-0.19)
Cash$_{t-1}$					-0.511**
					(-2.23)
GPPE$_{t-1}$					-0.265**
					(-2.38)
Dividend$_{t-1}$					-8.462***
					(-3.10)
Log(CEO Wealth$_t$)					0.089***
					(2.64)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	11,761	9,926	9,925	9,925	9,827
Log-likelihood	-4,786	-3,843	-3,794	-3,765	-3,706
Chi-square	17	323	435	487	518

Table 11: The impact of Vega on share issuance in high-levered firms

This table presents the logistic regression results of hypothesis 2b. *Share issuance* is a dummy variable and equals one if the net share issuance is at least 1% of total assets, zero otherwise. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year.. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is the total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Share issuance*$_t$

	(1)	(2)	(3)	(4)
$Log(1+Vega)_t$	0.024	-0.096***	-0.112***	-0.166***
	(0.88)	(-3.23)	(-3.76)	(-4.79)
$Log(1+Delta)_t$		0.255***	0.26***	0.263***
		(9.92)	(10.10)	(10.01)
$High\_leverage_{t-1}$	-0.029	0.07	0.135	0.056
	(-0.15)	(0.37)	(0.72)	(0.29)
$Log(1+Vega)_t*High\_leverage_{t-1}$	0.057	0.035	0.029	0.041
	(1.23)	(0.74)	(0.62)	(0.87)
$Log(1+Sales_{t-1})$	-0.226***	-0.264***	-0.219***	-0.232***
	(-8.31)	(-9.49)	(-7.68)	(-7.65)
MB_{t-1}	0.216***	0.182***	0.149***	0.151***
	(10.54)	(8.72)	(7.02)	(6.73)
$Cashflow_{t-1}$	-1.565***	-1.688***	-0.979***	-0.857***
	(-5.24)	(-5.60)	(-3.07)	(-2.64)
$Capex_t$	1.891***	1.711***	2.004***	2.155***
	(4.01)	(3.61)	(4.21)	(4.32)
RD_{t-1}			4.295***	4.690***
			(7.21)	(7.52)
$Rating_{t-1}$			-0.021	-0.048
			(-0.07)	(-0.17)
$Cash_{t-1}$				-0.530**
				(-2.33)
$GPPE_{t-1}$				-0.255**
				(-2.29)
$Dividend_{t-1}$				-8.479***
				(-3.10)
$Log(CEO\ Wealth_t)$				0.092***
				(2.71)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	9,926	9,925	9,925	9,827
Log likelihood	-3,841	-3,790	-3,763	-3,704
Chi-square	336	437	490	521

.

Table 12: The impact of Vega on debt repurchase

This table presents the logistic regression results for hypothesis 3a. *Debt retirement* is a dummy variable and equals one if the net share issuance is -0.5% or less of total assets. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Debt Retirement*$_t$

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log(1+Vega)$_t$	-0.038**	-0.097***	-0.062**	-0.059***	-0.096***
	(-2.19)	(-4.72)	(-2.63)	(-2.48)	(-3.40)
Log(1+Delta)$_t$			-0.065***	-0.066***	-0.058***
			(-2.99)	(-3.02)	(-2.63)
Industry_adjusted_leverage$_{t-1}$		3.066***	3.045***	3.016***	2.94***
		(16.39)	(16.26)	(16.07)	(15.37)
Log(1+Sales$_{t-1}$)		0.102***	0.11***	0.102***	0.093***
		(4.44)	(4.76)	(4.33)	(3.80)
MB$_{t-1}$		-0.091***	-0.081***	-0.072***	-0.059***
		(-4.35)	(-3.84)	(-3.33)	(-2.64)
Cashflow$_{t-1}$		-0.408	-0.394	-0.57*	-0.703**
		(-1.44)	(-1.39)	(-1.89)	(-2.31)
Capex $_t$		-3.903***	-3.838***	-3.88***	-4.246***
		(-8.07)	(-7.93)	(-8.00)	(-8.34)
RD$_{t-1}$				-1.001*	-0.820
				(-1.72)	(-1.34)
Rating$_{t-1}$				0.301	0.291
				(1.24)	(1.20)
Cash$_{t-1}$					-0.225
					(-1.02)
GPPE$_{t-1}$					0.223**
					(2.43)
Log(CEO Wealth$_t$)					0.058*
					(1.87)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	14,256	12,229	12,228	12,188	12,099
Log-likelihood	-6,606	-5,384	-5,379	-5,376	-5,313
Chi-square	16	524	524	528	531

Table 13: The impact of Vega on debt repurchase in high-levered firms

This table presents the logistic regression results for hypothesis 3b. *Debt retirement* is a dummy variable and equals one if the net share issuance is -0.5% of less of total assets. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year.. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Debt Retirement*$_t$

	(1)	**(2)**	**(3)**	**(4)**
Log(1+Vega)$_t$	-0.131***	-0.093***	-0.089***	-0.128***
	(-5.70)	(-3.63)	(-3.48)	(-4.29)
Log(1+Delta)$_t$		-0.074***	-0.075***	-0.066***
		(-3.42)	(-3.47)	(-3.00)
High_leverage$_{t-1}$	0.114	0.087	0.074	0.103
	(0.75)	(0.57)	(0.48)	(0.66)
Log(1+Vega)$_t$***High_leverage*$_{t-1}$	0.146***	0.152***	0.153***	0.142***
	(3.89)	(4.03)	(4.05)	(3.74)
Log(1+Sales$_{t-1}$*)*	0.122***	0.131***	0.121***	0.103***
	(5.40)	(5.75)	(5.22)	(4.25)
MB$_{t-1}$	-0.098***	-0.087***	-0.076***	-0.055***
	(-4.78)	(-4.20)	(-3.56)	(-2.48)
Cashflow$_{t-1}$	-0.715***	-0.698***	-0.912***	-1.086***
	(-2.58)	(-2.52)	(-3.10)	(-3.64)
Capex$_t$	-3.803***	-3.723***	-3.775***	-4.237***
	(-7.90)	(-7.73)	(-7.83)	(-8.32)
RD$_{t-1}$			-1.221**	-0.768
			(-2.13)	(-1.28)
Rating$_{t-1}$			0.323	0.314
			(1.33)	(1.30)
Cash$_{t-1}$				-0.545**
				(-2.51)
GPPE$_{t-1}$				0.248***
				(2.72)
Log(CEO Wealth$_t$*)*				0.067**
				(2.19)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	12,229	12,228	12,228	12,099
Log likelihood	-5,443	-5,436	-5,433	-5,362
Chi-square	398	410	417	433

.

Table 14: The impact of Vega on share repurchase

This table presents the logistic regression results for hypothesis 4a. *Share repurchase* is a dummy variable and equals one if the net share issuance is -0.5% or less of total assets. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEOs wealth due to a 1% change in stock price. *Sales* is the proceeds from sales denoted in millions. *Industry_adjusted_leverage* is defined as *Leverage* minus industry mean leverage based on 2-digit SIC code. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is cash dividend payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth* is CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Share Repurchase*$_t$

	(1)	(2)	(3)	(4)	(5)
Log(1+*Vega*)$_t$	0.307***	0.249***	0.255***	0.259***	0.252***
	(15.80)	(10.55)	(9.51)	(9.62)	(7.89)
Log(1+*Delta*)$_t$			-0.012	-0.013	-0.008
			(-0.48)	(-0.52)	(-0.34)
Industry_adjusted_leverage$_{t-1}$		-2.081***	-2.085***	-2.113***	-1.808***
		(-9.46)	(-9.48)	(-9.57)	(-7.95)
Log(1+Sales$_{t-1}$*)*		0.170***	0.171***	0.163***	0.174***
		(6.64)	(6.64)	(6.19)	(6.22)
MB$_{t-1}$		-0.099***	-0.097***	-0.089***	-0.133***
		(-4.19)	(-4.07)	(-3.66)	(-5.15)
Cashflow$_{t-1}$		5.633***	5.634***	5.526***	5.610***
		(14.51)	(14.52)	(14.03)	(13.71)
Capex$_t$		-2.654***	-2.641***	-2.704***	-1.923***
		(-4.74)	(-4.71)	(-4.81)	(-3.31)
RD$_{t-1}$				-1.214*	-1.964***
				(-1.73)	(-2.67)
Rating$_{t-1}$				-0.093	-0.071
				(-0.34)	(-0.26)
Cash$_{t-1}$					0.913***
					(3.79)
GPPE$_{t-1}$					-0.272**
					(-2.50)
Dividend$_{t-1}$					8.494***
					(3.90)
Log(CEO Wealth$_t$*)*					0.011
					(0.30)
Year dummy	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Firm-year observations	13,157	11,120	11,119	11,119	11,010
Log-likelihood	-5,614	-4,462	-4,462	-4,457	-4,399
Chi-square	270	689	689	692	719

Table 15: The impact of Vega on share repurchase in highly levered firms

This table presents the logistic regression results for hypothesis 4b. *Share repurchase* is a dummy variable and equals one if the net share issuance is -0.5% or less of total assets. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. *Sales* is the proceeds from sales donated in millions. *High_leverage* is a dummy variable and equals one if the *industry_adjusted_leverage* of a firm is equal to 75 percentiles or above of the sample for a given year. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth is* CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

Dependent variable-*Share Repurchase*$_t$

	(1)	**(2)**	**(3)**	**(4)**
Log(1+Vega)$_t$	0.248***	0.252***	0.256***	0.256***
	(9.74)	(8.91)	(9.00)	(7.69)
Log(1+Delta)$_t$		-0.008	-0.009	-0.004
		(-0.31)	(-0.35)	(-0.15)
High_leverage$_{t-1}$	-0.443**	-0.445**	-0.457***	-0.324
	(-2.25)	(2.26)	(-2.32)	(-1.62)
Log(1+Vega)$_t$**High_leverage*$_{t-1}$	-0.019	-0.018	-0.017	-0.034
	(-0.41)	(-0.39)	(-0.37)	(-0.72)
Log(1+Sales$_{t-1}$)	0.151***	0.152***	0.144***	0.161***
	(5.95)	(5.94)	(5.51)	(5.79)
MB$_{t-1}$	-0.089***	-0.088***	-0.080***	-0.132**
	(-3.82)	(-3.72)	(-3.32)	(-5.13)
Cashflow$_{t-1}$	5.705***	5.705***	5.602***	5.706***
	(14.74)	(14.74)	(14.26)	(13.98)
Capex$_t$	-2.570***	-2.562***	-2.622***	-1.802***
	(-4.62)	(-4.60)	(-4.70)	(-3.13)
RD$_{t-1}$			-1.30*	-2.058***
			(-1.63)	(-2.81)
Rating$_{t-1}$			-0.099	-0.074
			(-0.37)	(-0.27)
Cash$_{t-1}$				1.086***
				(4.58)
GPPE$_{t-1}$				-0.293***
				(-2.70)
Dividend$_{t-1}$				9.714***
				(4.23)
Log(CEO Wealth$_t$*)*				0.005
				(4.23)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	11,120	11,119	11,119	11,010
Log likelihood	-4,476	-4,476	-4,474	-4,407
Chi-square	661	661	664	703

Table 16: Over-leverage based on Target debt ratio estimated from firm fundamentals

This table presents the logistic regression results for hypothesis 1b, 2b, 3b, and 4b based on target debt ratio which is estimated from firm fundamentals. *Debt issuance, retirement, Share issuance and repurchase* are dummy variables and equals one if the net debt issuance is 1% or more, -0.5% or less, and share issuance is 1% or more and -0.5% or less of total assets respectively. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. *Sales* is the proceeds from sales donated in millions. *Over_leverage* is a dummy variable and equals one if the long-term leverage of a firm is above its target leverage in a given year. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Dividend* is total cash dividends payout scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, zero otherwise. *CEO Wealth is* CEO total compensation. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parenthesis.

	Debt Issuance	**Share Issuance**	**Debt Retirement**	**Share Repurchase**
	(1)	**(2)**	**(3)**	**(4)**
Log(1+Vega)$_t$	0.115***	-0.181***	-0.136***	0.293***
	(3.50)	(-4.90)	(-4.22)	(8.82)
Log(1+Delta)$_t$	-0.014	0.262***	-0.065**	-0.002
	(-0.61)	(9.98)	(-2.94)	(-0.08)
Over_leverage$_{t-1}$	-0.010	-0.128	0.290**	0.027
	(-0.07)	(-0.76)	(2.08)	(0.16)
*Log(1+Vega)$_t$*Over_leverage$_{t-1}$*	-0.072**	0.063	0.091***	-0.103***
	(-2.09)	(1.55)	(2.68)	(-2.62)
Log(1+Sales $_{t-1}$)	-0.086***	-0.229***	0.111***	0.155***
	(-3.48)	(-7.55)	(4.56)	(5.57)
MB$_{t-1}$	0.039*	0.150***	-0.060***	-0.129**
	(1.81)	(6.67)	(-2.71)	(-5.00)
Cashflow$_{t-1}$	0.302	-0.944***	-1.314***	5.889***
	(0.97)	(-2.92)	(4.44)	(14.44)
Capex $_t$	6.344***	2.128***	-4.353***	-1.742***
	(13.34)	(4.28)	(-8.52)	(-3.02)
RD$_{t-1}$	1.313**	4.602***	-0.896	-1.979***
	(2.07)	(7.38)	(-1.49)	(-2.70)
Rating$_{t-1}$	0.044	-0.053	0.283	-0.058
	(0.18)	(-0.19)	(1.17)	(-0.21)
Cash$_{t-1}$	-3.204***	-0.530**	-0.329	0.984***
	(-13.30)	(-2.30)	(-1.50)	(4.08)
GPPE$_{t-1}$	-0.161*	-0.269**	0.194**	-0.263**
	(-1.75)	(-2.41)	(2.12)	(-2.42)
Dividend$_{t-1}$		-8.833***		9.566***
		(-3.23)		(4.41)
Log(CEO Wealth $_t$)	0.029	0.089***	0.058*	0.009
	(0.94)	(2.62)	(1.87)	(0.26)
Year dummy	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Firm-year observations	12,013	9,827	12,099	11,010
Log likelihood	-5,195	-3,706	-5,355	-4,411
Chi-square	464	517	447	705

Table 17: High_leverage, low_leverage, and their interactions with Vega

Debt issue is the proceeds from gross debt issuance minus gross debt retired. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. Asset is log (1+book value of total assets) *High_leverage* is a dummy variable and equals one if the leverage of a firm is equal to 75 percentiles or above of sample leverage. *Low_leverage* is a dummy variable and equals one if the leverage of a firm is equal to 25 percentiles or less of sample leverage. *MB* is the ratio of market value of total assets to book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. . *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parentheses.

Dependent variable-*Debt issue*$_t$

	(1)	**(2)**	**(3)**
Constant	0.022***	0.02***	0.011
	(3.02)	(2.70)	(1.46)
Log(1+Vega)$_t$	0.004***	0.003***	0.003***
	(3.97)	(3.18)	(3.27)
Log(1+Delta)$_t$		0.000	0.001
		(1.23)	(1.20)
High_leverage$_{t-1}$	-0.012**	-0.012*	-0.014***
	(-1.96)	(-1.93)	(-2.33)
Low_leverage$_{t-1}$	-0.000	-0.000	0.001
	(-0.02)	(-0.10)	(0.13)
Log(1+Vega)$_t$**High_leverage*$_{t-1}$	-0.003*	-0.003*	-0.003*
	(-1.81)	(-1.83)	(-1.76)
Log(1+*Vega)*$_t$**Low_leverage*$_{t-1}$	0.003*	0.003*	0.003*
	(1.78)	(1.83)	(1.88)
Asset $_{t-1}$	-0.005***	-0.005***	-0.005***
	(-5.54)	(-5.65)	(-6.07)
MB$_{t-1}$	0.001	0.001	0.001
	(1.53)	(1.32)	(1.62)
Cashflow$_{t-1}$	0.018*	0.017*	0.015
	(1.87)	(1.80)	(1.58)
Capex $_t$	0.197***	0.196***	0.187***
	(12.18)	(12.10)	(11.50)
Industry_mean_leverage$_{t-1}$			0.064***
			(3.98)
Year dummy	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes
Adjusted R-squared	7.41%	7.41%	7.53%
Firm-year observations	13,563	13,562	13,562

Table 18: The effect of High_vega, Low_vega, High_leverage, and Low_leverage on Security issues

Debt issue is the proceeds from gross debt issuance minus gross debt retired. *Share issue* is the proceeds from common and preferred share issuance minus gross share repurchase. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *High_vega* is a dummy variable and equals one if the *Vega* of a CEO is equal to 75 percentiles or above of sample *Vega*. *Low_vega* is a dummy variable and equals one if the *Vega* of a CEO is equal to 25 percentiles or less of sample *Vega*. *High_leverage* is a dummy variable and equals one if the leverage of a firm is equal to 75 percentiles or above of sample leverage. *Low_leverage* is a dummy variable and equals one if the leverage of a firm is equal to 25 percentiles or less of sample leverage. Asset is log (1+book value of total assets). *MB* is the ratio of market value of total assets to book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. . *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. z statistics are in parentheses.

	Debt issue$_t$	***Share issue***$_t$
	(1)	**(2)**
Intercept	0.026***	0.061***
	(3.44)	(9.59)
High_Vega$_t$	0.006**	-0.008***
	(2.37)	(-4.24)
Low_Vega$_t$	-0.008***	0.008***
	(-4.03)	(4.35)
High_leverage$_{t-1}$	-0.024**	0.008***
	(-10.53)	(4.15)
Low_leverage$_{t-1}$	0.011***	-0.13***
	(4.51)	(-6.33)
Asset $_{t-1}$	-0.005***	-0.007***
	(-5.61)	(-10.00)
MB$_{t-1}$	0.001**	0.006***
	(2.13)	(10.51)
Cashflow$_{t-1}$	0.016*	-0.16***
	(1.73)	(-19.94)
Capex $_t$	1.88***	0.082***
	(11.56)	(5.97)
Industry_mean_leverage$_{t-1}$	0.064***	0.001
	(4.00)	(0.11)
Year dummy	Yes	Yes
Firm fixed effect	Yes	Yes
Adjusted R-squared	7.43%	22.78%
Firm-year observations	13,563	13,563

Table 19: 2SLS Equations- Vega and Debt issue

Debt issue is the proceeds from gross debt issuance minus gross debt retired. *Vega* is the change in CEO wealth from stock options due to a 1% change in stock return volatility. *Delta* is the change in CEO wealth due to a 1% change in stock price. *Sales* is log (1+proceeds from sales). *Leverage* is the ratio of long-term debt over book value of total assets. *MB* is the ratio of market value of total assets to book value of total assets. *GPPE* is gross property, plant and equipment over book value of total assets. *Cashflow* is EBITDA scaled by book value of total assets. *Cash* is cash and cash equivalent assets over book value total assets. *RD* is the total expenditures of research and development scaled by book value of total assets. *Capex* is capital expenditure scaled by book value of total assets. *Rating* is a dummy variable and equals one if credit rating of a firm is available, otherwise. Cash compensation is the salary plus bonus CEOs receive. CEO wealth is the total compensation CEOs receive. *, ** and *** represent statistical significance at the 10%, 5% and 1% levels respectively. t statistics are in parenthesis.

	First-stage regression	Second stage regression	First-stage regression	Second stage regression
	Log(1+*Vega*)$_t$	***Debt issue*$_t$**	**Log(1+*Vega*)$_t$**	***Debt issue*$_t$**
Intercept	-0.937***	0.401***	-3.227***	2.730***
	(-10.17)	(6.66)	(-22.96)	(5.33)
Log(1+*Vega*)$_t$		0.428***		0.841***
		(8.41)		(5.57)
Log(1+*Delta*)$_t$	0.415***	-0.174***	0.256***	-0.212***
	(45.62)	(-8.07)	(23.45)	(-5.48)
MB$_{t-1}$	0.03***	-0.01**	- 0.010	0.011*
	(3.58)	(-2.54)	(-1.35)	(1.69)
Cashflow$_{t-1}$	0.11	-0.038	0.268***	-0.214
	(1.03)	(-0.82)	(2.79)	(-2.36)
Sales$_{t-1}$	0.315***	-0.139***	0.128***	-0.111***
	(41.07)	(-8.53)	(12.35)	(-5.58)
Leverage $_{t-1}$	-0.065	-0.24***	-0.083	-0.203***
	(-0.69)	(-6.09)	(-1.11)	(-3.60)
Cash $_{t-1}$	0.48***	-0.23***	0.161**	-0.161***
	(6.22)	(-5.79)	(2.27)	(-2.61)
RD $_{t-1}$	2.293***	-0.966***	1.382***	-1.146***
	(11.83)	(-6.80)	(6.99)	(-4.46)
Capex $_t$	-1.423***	0.725***	-0.628***	0.639***
	(-8.37)	(7.22)	(-4.45)	(4.36)
Rating $_{t-1}$	0.069	-0.026	0.069	-0.053
	(0.91)	(-0.79)	(1.16)	(-1.05)
Log (Cash compensation)			0.066***	-0.060***
			(3.26)	(-3.10)
Log(CEO Wealth)			0.619***	-0.519***
			(18.29)	(-5.09)
CEO Age			-0.010***	0.008***
			(-9.61)	(4.93)
Leverage $_t$	0.808***		0.419***	
	(8.75)		(5.67)	
R-squared	43.50%		62.37%	
Firm-year observations	13,536	13,536	12,527	12,527
Wald Chi-squared		81.39		35.98